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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/717,207	11/19/2003	J. Thomas Fowler	3556.1000-004	6009
21005	7590	12/16/2005	EXAMINER	
HAMILTON, BROOK, SMITH & REYNOLDS, P.C. 530 VIRGINIA ROAD P.O. BOX 9133 CONCORD, MA 01742-9133			PIGGUSH, AARON C	
			ART UNIT	PAPER NUMBER
			2838	

DATE MAILED: 12/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/717,207

Applicant(s)

FOWLER ET AL.

Examiner

Aaron Piggush

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 November 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7, 12, 13 and 18-22 is/are rejected.
- 7) ☒ Claim(s) 8-11 and 14-17 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 7/6/04 & 10/21/04.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-7, 12, 13, 20, and 22 are rejected under 35 U.S.C. 102(b) as being anticipated by Eaves (US 5,656,915).

With respect to claim 1, Eaves discloses a system for balancing state of charge among plural series connected electrical energy storage units, comprising:

a string of electrical energy storage units (no. 4a-4d in Fig. 1); and

a power converter selectively coupled to an individual storage unit of the string (col 16 ln 5-17), the power converter transferring energy bidirectionally between the individual storage unit and the string of storage units (col 16 ln 7-11 and ln 53-56).

With respect to claim 2, Eaves discloses the system of claim 1, wherein the power converter transfers energy at a controllable rate of transfer (col 18 ln 35-42 and col 17 ln 25-31).

With respect to claim 3, Eaves discloses the system of claim 1, wherein the power converter monitors voltage and current data of the individual storage unit resulting from the transferring of energy (col 16 ln 37-52).

With respect to claim 4, Eaves discloses the system of claim 1, wherein the power converter transfers units of energy between the individual storage unit and the string of storage units (col 16 ln 53-56 and ln 10-13).

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With respect to claim 5, Eaves discloses the system of claim 1, wherein the power converter comprises:

- a primary inductor (no. 7p in Fig. 1);
- a first secondary inductor magnetically coupled to the primary inductor (no. 7s in Fig. 1);
- a first switch selectively coupling the individual storage unit to the primary inductor (no. 16e in Fig. 2a); and
- the first secondary inductor coupling to an output capacitor (no. 8c in Fig. 1);
- the output capacitor coupled in parallel to the string of storage units (no. 8c and 4a-4d in Fig. 1).

Additionally, when the first switch mentioned above selectively couples the individual storage unit to the primary inductor, the circuit will have another switch closed so that there will be a complete connection across the battery cell selected, as can be seen in Fig. 2a.

With respect to claim 6, Eaves discloses the system of claim 5, further wherein:

- when the first switch is on, energy is transferred from the individual storage unit to charge the primary inductor (col 13 ln 20-22); and
- when the first switch is off, the energy being discharged into the first secondary inductor to charge the output capacitor, the output capacitor discharging energy to the string of storage units (col 13 ln 22-27).

With respect to claim 7, Eaves discloses the system of claim 5, further comprising:

a first pulse generator (no. 1 in Fig. 1) providing first enable signals to the first switch (no. 2 in Fig. 1, no. 27, 26a, 26c, and 26d in Fig. 3, and col 16 ln 21-37);

the first switch coupling the individual storage unit to the primary inductor (no. 16e in Fig. 2a is coupled to no. 7p in Fig. 1) in response to the first enable signals, resulting in energy being transferred from the individual storage unit to the string of storage units (col 16 ln 7-11 and ln 53-56 and col 13 ln 22-27).

Furthermore, the microcontroller acts as a pulse generator because it generates a pulse signal to the MUX and the driver, which in turn force the MOSFET switches of the device to turn on or off and connect the storage unit or units to the inductor.

With respect to claim 12, Eaves discloses the system of claim 1, further comprising:

a primary inductor (no. 7p in Fig. 1);

a first secondary inductor magnetically coupled to the primary inductor (no. 7s in Fig. 1);

a second switch selectively coupling the first secondary inductor to the string of storage units (no. 16c in Fig. 2a);

energy being transferred from the string of storage units to charge the first secondary inductor when the second switch is on (col 13 ln 20-22);

the energy being discharged into the primary inductor and charging the individual storage unit when the second switch is off (col 13 ln 22-27).

Additionally, when the second switch mentioned above selectively couples the first secondary inductor to the string of storage units, the circuit will have another switch

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closed so that there will be a complete connection across the battery cells selected, as can be seen in Fig. 2a.

With respect to claim 13, Eaves discloses the system of claim 12, further comprising:

a first pulse generator (no. 1 in Fig. 1) providing first enable signals to the second switch (no. 2 in Fig. 1, no. 27, 26a, 26c, and 26d in Fig. 3, and col 16 ln 21-37);

the second switch coupling the string of storage units to the first secondary inductor (no. 16c in Fig. 2a is coupled to no. 7s in Fig. 1) in response to the first enable signals, resulting in energy being transferred from the sting of storage units to the individual storage unit (col 16 ln 7-11 and ln 53-56 and col 13 ln 22-27).

Furthermore, the microcontroller acts as a pulse generator because it generates a pulse signal to the MUX and the driver, which in turn force the MOSFET switches of the device to turn on or off and connect the storage unit or units to the inductor.

With respect to claim 20, Eaves discloses the system of claim 1, wherein each storage unit is a storage cell (col 4 ln 25-26 and no. 4a-4d in Fig. 1).

With respect to claim 22, Eaves discloses the system of claim 1, wherein a battery pack comprises a string of one or more storage units (col 4 ln 25-26 and no. 4a-4d in Fig. 1).

3. Claims 1, 18, 19, and 21 are rejected under 35 U.S.C. 102(b) as being anticipated by Anzawa (US 2002/0109482).

With respect to claim 1, Anzawa discloses a system for balancing state of charge among plural series connected electrical energy storage units, comprising:

a string of electrical energy storage units (no. 1-1, 1-2, and 1-n in Fig. 1); and

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a power converter selectively coupled to an individual storage unit of the string (pg 2 para 0016 and 0017), the power converter transferring energy bidirectionally between the individual storage unit and the string of storage units (pg 2 para 0018 to 0023).

With respect to claim 18, Anzawa discloses the system of claim 1, wherein the power converter comprises:

an up-converter transferring energy from the individual storage unit to the string of storage units (T and inductors near S2 and S1 in Fig. 11); and

a down-converter transferring energy from the string of storage units to the individual storage unit (T and inductors near S1 and S2 in Fig. 11).

Additionally, the transformer of Fig. 11 acts as an up-converter or a down-converter because of the turn ratio difference. When the charge from an individual storage unit is transferred to the capacitor (through the inductor near an individual storage unit to the inductor near S1), the charge will be greater because it is moving from an inductor with less turns to one with greater turns. That charge is then used for the equalization of the other storage units. Furthermore, when the charge from a string of storage units is transferred from the capacitor (through the inductor near S1 to the inductor near an individual storage unit), the charge will be smaller because it is moving from an inductor with more turns to one with less turns. That charge is used for the equalization of the individual storage unit (pg 10 para 184).

With respect to claim 19, Anzawa discloses the system of claim 18, wherein the power converter comprises:

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a common transformer that is used as a down converter to transfer energy from the string of storage units to charge the individual storage unit (T and inductors near S1 and S2 in Fig. 11); and

the common transformer that is used as an up converter to transfer energy from the individual storage unit to the string of units in order to discharge the individual storage unit (T and inductors near S2 and S1 in Fig. 11).

Further explanation for the rejection of claim 19 is addressed above in the rejection of claim 18.

With respect to claim 21, Anzawa discloses the system of claim 1, wherein each storage unit is a battery module having a string of storage units (three battery modules containing three storage units within each in Fig. 3 and pg 7 para 0129).

Allowable Subject Matter

4. Claims 8-11 and 14-17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 8 and 14 recite a second pulse generator providing second enable signals to the first pulse generator, wherein the second enable signals control the transfer of energy at a controllable rate by controlling the first pulse generator.

Claims 9, 10, and 11 depend upon claim 8.

Claim 15, 16, and 17 depend upon claim 14.

The art of record does not disclose the above limitations, nor would it be obvious to modify the art in such a manner.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Schmidt (US 5,821,729) discloses a method and device for charge exchange between a plurality of energy storage or converters connected in series.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Aaron Piggush whose telephone number is 571-272-5978. The examiner can normally be reached on Monday-Friday 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Karl Easthom can be reached on 571-272-1989. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AP


KARL D. EASTHOM
PRIMARY EXAMINER